

**DEVELOPMENT AND TESTING OF A DEUTERIUM GAS TARGET ASSEMBLY
FOR NEUTRON PRODUCTION VIA THE $H-2(d,n)He-3$ REACTION
AT A LOW-ENERGY ACCELERATOR FACILITY**

by

Dominique Feautrier and Donald L. Smith

ABSTRACT

This report describes the development and testing of a deuterium gas target intended for use at a low-energy accelerator facility to produce neutrons for basic research and various nuclear applications. The principle source reaction is $H-2(d,n)He-3$. It produces a nearly mono-energetic group of neutrons. However, a lower-energy continuum neutron spectrum is produced by the $H-2(d;n,p)H-2$ reaction and also by deuterons which strike various components in the target assembly. The present target is designed to achieve the following objectives: i) minimize unwanted background neutron production from the target assembly, ii) provide a relatively low level of residual long-term activity within the target components, iii) have the capacity to dissipate up to 150 watts of beam power with good target longevity, and iv) possess a relatively modest target mass in order to minimize neutron scattering from the target components. The basic physical principles that have to be considered in designing an accelerator target are discussed and the major engineering features of this particular target design are outlined. The results of initial performance tests on this target are documented and some conclusions concerning the viability of the target design are presented.